



# Taxonomy-Based Pandemic Influenza Surveillance Utilizing Media Sources

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## Introduction: Pandemic Influenza

### Influenza Pandemics and Resulting Mortality

- 1918 Spanish Influenza (A/H1N1)
  - ~50 million deaths globally
- 1957 Asian Influenza (A/H2N2)
  - ~2 million deaths globally, ~70K deaths in the US
- 1968 Hong Kong Influenza (A/H3N2)
  - ~1 millions deaths globally, ~34K deaths in the US
- 2009-H1N1 Influenza (A/H1N1)
  - Ongoing

### Early Warning is Critical

- Rapid response initiation
- Mitigation of disease effects

## Methodology: Overview



### Our Approach

- Develop an indications and warning (I&W) taxonomy of pandemic influenza
- Monitor media sources for markers of social disruption indicative of anomalous respiratory disease/influenza activity
- Identify pandemic I&W signature, compare to seasonal year
- Study period: 1967 - 1968

## Methodology: Taxonomy Development



### Infectious Disease Taxonomy

#### Process

- Selected highly disruptive historical biological events
- Collected articles from news media archives that directly or indirectly referenced the selected event
- Validated the taxonomy by conducting a series of case studies

#### Conclusions

- I&W were present in media reports prior to statements of action from the international public health community
- I&W increased in volume and diversified in type as the event progressed

"A Heuristic Indication and Warning Staging Model for Detection and Assessment of Biological Events ." JAMIA, 2008.

## Methodology: Taxonomy Development



### Pandemic Influenza Taxonomy

#### Goal

- To identify I&W for pandemic influenza in Hong Kong and Southern China during the 1968 pandemic

#### Process

- Collected articles from news media archives that directly or indirectly referenced the event
- Identified the societal response to disease baselines during seasonal and pandemic years
- Applied the retrospective pandemic influenza taxonomy to the collected relevant articles

## Methodology: Taxonomy Detail



### Pandemic Influenza Taxonomy

- 93 Parameters
  - Direct I&W Parameters
    - 1 Main Category
  - Indirect (Social Disruption) I&W Parameters
    - 6 Main Categories
  - Region, Culture, and Disease Specific

## Methodology: Taxonomy Detail



### Seven Main Pandemic Influenza I&W Categories

Category	Definition
<i>Report of Human Disease</i>	Media reports of illness of a known or unknown disease entity at a uni-focal or multi-focal level.
<i>Official Acknowledgement</i>	Media reports of acceptance or denial of disease from an official source and/or type of reporting.
<i>Community Acknowledgement</i>	Media reports of acceptance or denial of disease by a person with accreditation less than an official, but more than locals.
<i>Official Action</i>	Media reports of implementation of countermeasures, biosurveillance, health alerts, official investigations, and changes to current policies and procedures by authorities at local, national and/or international levels.
<i>Integrity of Infrastructure</i>	Media reports of compromise or collapse of a society.
<i>Local Perception of Threat</i>	Media reports of periods of heightened anxiety and public concern within a society.
<i>Business Practice Changes</i>	Media reports of changes in the economic markets.

## Methodology: Case Study, 1968



### Article Collection

- Target region was Hong Kong and Southern China
- ~120 source-months of articles from 1967-1968
  - Accessed at the Library of Congress and Georgetown University Library
- 1 Chinese-language source
- 4 English-language sources

## Methodology: Taxonomy Application

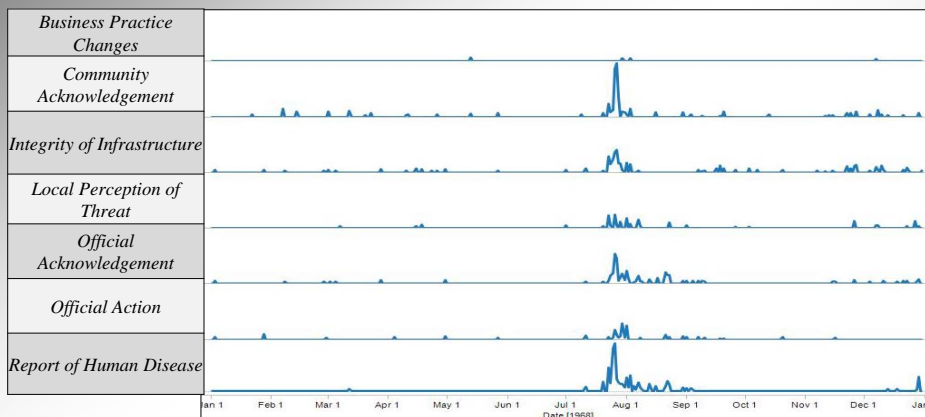


News Media Article	I&W Categorization	Article Justification
<p><i>Hong Kong Tiger Standard, 09.01.68 – “Flu Fears”</i></p> <ul style="list-style-type: none"> <li>• Fear mounted as a new type of Asian influenza prevalent in Hongkong may invade Japan earlier than expected as it has already spread to Taiwan, UPI reports.</li> <li>• The health and welfare ministry said it would hold an emergency meeting next week with some 100 quarantine officials across the nation attending to discuss countermeasures against the influenza.</li> </ul>	Report of Human Disease	1 [Fear mounted as] a new type of Asian influenza prevalent in Hongkong [may invade Japan earlier than expected] as it has already spread to Taiwan.
	Local Perception of Threat	2 <b>Fear mounted</b> [as a new type of Asian influenza prevalent in Hongkong] <b>may invade Japan earlier than expected</b> [as it has] <b>already spread to Taiwan.</b>
	Official Acknowledgement	3 <b>The Health and Welfare Ministry said</b> it would hold an emergency meeting next week with some 100 quarantine officials across the nation attending to discuss countermeasures against the influenza.
	Official Action	4 <b>The Health and Welfare Ministry</b> [said it would] <b>hold an emergency meeting</b> [next week with some 100 quarantine officials across the nation attending to discuss] <b>countermeasures against the influenza.</b>

## Results: Adjusted I&W Rate by Category, 1968



### Seven Main Pandemic Influenza I&W Categories



## Conclusions



- We developed and applied a methodology that converts qualitative information into quantitative and potentially actionable information.
- Our taxonomy-based media surveillance approach may enable early detection and situational awareness of an anomalous influenza season.
  - The number of disease indicators per article appeared to increase in the pandemic year compared to the seasonal year in Hong Kong and Southern China.
  - *Continued on next slide*

## Conclusions



- A distinct time-varying signature of indicators appeared to differentiate between pandemic and seasonal influenza years in Hong Kong and Southern China.
- The differences in indicator rate and frequency for the full year and for the month of pandemic emergence were statistically significant.
- Georgetown has applied this methodology, to some degree, using real-time electronically captured media throughout the 2009-H1N1 influenza pandemic.



**END OF PRESENTATION, THANK YOU**